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ABSTRACT

This paper discusses distance learning with microcomputers and describes how the University of the Virgin Islands (UVI) has used and plans to utilize this technology. The paper is divided into the following topics of discussion: (1) distance learning systems with microcomputers; (2) educational needs of the U.S. Virgin Islands; (3) a profile of UVI; (4) the beginnings of distance learning at UVI; (5) a distance learning experiment in BASIC programming using telecommunications equipment (remote site versus home learning site learning); (6) 17 general findings based on the results of the study; (7) recent research and development in remote site learning; and (8) future directions in distance education using microcomputers. (2 references) (CGD)

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DISTANCE LEARNING WITH MICROCOMPUTERS IN THE VIRGIN ISLANDS

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Abstract

A description of distance learning in the U. S. Virgin Islands is given. The University of the Virgin Islands has set up a distance learning system utilizing telephone lines to carry both audio and computer transmissions. The audio transmissions originate from microphones at each site and are delivered through audio conferencing speakers. Visual images are created simultaneously at each site by microcomputers and are shown on large and standard-size screen monitors. Various experiments and programs in distance learning in the Virgin Islands are presented. The teaching of a two credit BASIC programming course (CSC 101) using the long distance learning system on the two campuses of the University of the Virgin Islands is presented in depth. Current and future projects in distance learning using microcomputers in the Virgin Islands are discussed.

Distant Learning with Microcomputers in the Virgin Islands

Rodney Clarken, Lynn Rosenthal and Alan Lewit

The technology of education is changing rapidly. Of all the latest technological developments in education, telecommunications and computers have been the most influential. The University of the Virgin Islands (UVI) is using both telecommunications and computers in experiments and programs to bring educational opportunities where they previously did not exist, or where they only existed to a limited degree. This paper will describe distance learning with microcomputers and describe how the University of the Virgin Islands has used and plans to utilize this technology. Some of the findings from the UVI experience of using this distance learning system are presented.

Distance Learning with Microcomputers

Various distance learning systems employ telecommunication devices to connect classrooms at two or more sites. The mode of communications can be either one way or two way and can employ audio and/or visual media.

The communication can be conveyed either through wire connections such as telephone lines; through air waves using radio, microwave or satellite equipment; or through a combination of both. The present telecommunications technology supports full motion or freeze frame television, text or graphics displayed on computer-linked monitors and audio conferencing systems.

The University of the Virgin Islands' distance learning network presently utilizes telephone lines to carry both audio and computer transmissions. The audio transmissions originate from microphones at each site and are delivered through audio conferencing speakers to allow participants at all sites to speak to one another. Images are created simultaneously at each site by computers and shown on large and standard-size screen monitors. Modems connect these microcomputers over telephone lines using telecommunications software developed at the University of the Virgin Islands.

The U.S. Virgin Islands

The United States Virgin Islands are a small group of islands in the West Indies about 1100 miles southeast of Miami, Florida. They consist of three major islands: St. Thomas, St. John and St. Croix. The more than 100,000 people who inhabit these islands come from many diverse backgrounds. Because of limited funds, smallness of numbers, distance from the U. S. mainland, and geographical separation, educational opportunities are limited.

The educational needs are great. The level of educational achievement in the public elementary and secondary schools of the Virgin Islands is far below the average on the U. S. mainland. The ability to provide more educational services are exacerbated by the poor financial conditions of the Virgin Islands' government and the high cost of living in the Virgin Islands (Department of Education, 1985).

The University of the Virgin Islands

The University of the Virgin Islands (UVI) is a small, co-educational, liberal arts, four-year institution. It is an accredited land grant university which was established in 1962 by the government of the Virgin Islands to meet the higher educational needs in the Virgin Islands and the Caribbean. It serves the same purposes as a state land grant institution in the United States.

The university maintains two campuses located on the islands of St. Thomas and St. Croix in order to serve these major island communities, but a small population limits the economic practicality of certain educational offerings. The university enrollment for both campuses consists of approximately 800 full-time undergraduate, 2,000 part-time undergraduates and 200 graduate students (College of the Virgin Islands, 1984). The majority of the students who enroll at the University of the Virgin Islands require additional skills in English, mathematics and reading before they are eligible to take college level course work.

Because of the small number of full-time teaching faculty (about 100), the wide range of associate, baccalaureate, and graduate programs (about 30) and the geographical separation by water, distance learning is an attractive option for providing more educational opportunities.

The Beginnings of Distance Learning at UVI

The University of the Virgin Islands has conducted experiments in distance learning since 1984. The distant learning program evolved from a need to balance pressure to offer equal educational opportunities in multiple locations against the necessity of avoiding expensive duplication of faculty.

The University developed a system called INTERCEPT which linked microcomputers so that input to any system was routed to all computers. All computers can therefore run the same programs simultaneously, produce the same results, and display the same visual images.

In the early stages of its development, field tests were conducted between the St. Thomas and St. Croix campuses of UVI using volunteers in a series of four one-hour class sessions. Later these same sessions were offered to volunteers on other islands in the eastern Caribbean. There were many problems with software, hardware and transmission

during these field tests which have now been largely resolved.

Audio transmissions utilized Darome conference phones. These conference phones use a series of push-to-talk microphones distributed among the students to address the remote sites, and an audio speaker at each site to amplify the incoming voices.

The computer-link utilized Apple IIe and Apple IIgs computers connected through telephone lines by modems. Computer input by any keyboard or mouse was transmitted to the other computer and displayed on large screen and standard-size monitors at both sites. Simultaneous display of graphic images, pre-stored at all sites or simultaneously generated at all sites, was also possible.

This telecommunications system was also used for other things besides course instruction. The University used it for inter-campus committee and general faculty meetings. In 1986, an international conference on telecommunications held at the St.

Thomas of UVI used telecommunications to connect the conference site with other sites throughout the Caribbean and the mainland United States.

Distance Learning Experiment In BASIC Programming

After a series of field tests, the University of the Virgin Islands (UVI) offered a two credit course (CSC 101) in BASIC programming using telecommunications equipment for both audio and computer-linked nodes connected by telephone lines between the two campuses on the islands of St Thomas and St. Croix.

In the Spring semester of 1987, Drs. Rosenthal and Lewit joined the lecture components of their two BASIC programming classes on each campus and took turns each week teaching the lecture while the other instructor served as the remote site facilitator. The computers were connected under the CP/M version of INTERCEPT and were running under the Microsoft BASIC environment. Both instructors had been using computers with large screen monitors in teaching this course before this distance learning experiment and both were very comfortable with the media. The challenge in teaching long-distance was in adopting an instructional technique which would equally provide learning to students of the remote and live site classes.

There were twenty-six students on St. Thomas and eleven students on St. Croix participating in this course. the course was taught simultaneously with the professors on each campus alternating as the instructor and remote site facilitator. At the end of each weekly one-hour class period a short assessment was given over the material presented during that class period to both the remote and home-site students. The results of these assessments, along with pre-and post-instructional knowledge and attitude assessments were to be used to determine differences between home and remote site learning.

The experiment was designed to compare the assessment scores of the home site and the remote site students over the semester to determine if a pattern of scores would be associated with remote site instruction. The inability to control all of the extraneous variables related to the students performance on these assessments made the findings very suspect and the data of little value. The reliability and validity of the data was affected by the fact that experimental design and controls had to give way to instructional design and needs. Some of those factors were:

- a) much of the critical learning in this course depended on follow-up practice during the three-hour laboratories conducted live at both sites;
- b) understanding the lecture, and therefore performance on the assessment depended on previous learnings;
- c) students could get additional tutoring during the week; and
- d) assistance with understanding assessment questions was given after the telecommunications system was disconnected and some variation existed between sites.

Findings

Even though reliable and valid quantitative data was not obtained for the above experiment, the data and qualitative judgements of those involved with the experiment indicated very little difference between remote site and home site learning. The generalizability of these findings to other courses at the University of the Virgin Islands is limited to the fact that

both professors were very comfortable with the technology and had actually taught their traditional BASIC programming course using the computer and large screen monitor as the primary instructional media prior to this experiment. Professors with less experience, familiarity and ability would have more difficulty using the distance learning system. Content in this course was ideally suited to this telecommunications technology. Good results might be expected where similar content and technology matches are possible, such as using word processing to teach composition and spreadsheets to teach accounting. In other contexts, results might not be as favorable.

As a result of this experiment and our other experiences with distance learning, we have formulated a number of general findings.

1. The same principles of good pedagogical practice apply to both conventional instruction and distant learning, but weaknesses are accentuated. For example, if the lecturer is boring or disorganized, these qualities are more noticeable at a remote site.
2. Instructional goals and techniques must drive the selection of technology, not vice versa.
3. Success in the application of technology is in direct proportion to its transparency. This means that the media and technology should allow students and instructors to focus on the subject material with as little distraction as possible.
4. Preparation of instruction is critical. Lack of support materials or pauses and gaps in the instructional flow are glaringly apparent.
5. Instructors must force interaction because students are often "mike shy", physical absence of the instructor creates a context in which students feel less necessity for involvement and participation, and transfer of attitudes from entertainment media produce an expectation of a passive experience.
6. Questions must be directed to specific students, as general questions do not tend to elicit much response.
7. With the loss of visual feedback from students' expressions and body language the instructor will have less awareness of lack of comprehension. Interaction with the students is essential and this is accomplished primarily through oral questioning.
8. A remote-site facilitator is important to "read" the class and alert the instructor to problems in comprehension and to monitor the activities at the remote site.
9. Equipment should be permanently installed with concealed wiring. Constant setting up and taking down is hard on the hardware and the nerves of support staff, is time consuming and can result in system failure because of faulty connections.
10. Backup equipment must be available, and the procedures to be followed in case of system failures must be clearly understood.
11. The utility of distant learning technology in providing guest speakers or allowing faculty to support critical instruction during professional travel should not be overlooked,

but NEVER try transmission from a hotel or unfamiliar environment without adequate pretesting.

12. Expressed student preferences for a "live" instructor do not necessarily correlate with learning performance.
13. The use of technology and an unfamiliar situation creates tension in some students which can be easily communicated to the rest of the class. A relaxed approach is particularly important in the beginning to set the right tone for the class.
14. Some time should be devoted initially to allowing students to use and become comfortable with equipment.
15. An early visit by the instructor a distant class is strongly recommended. Such contact should be supplemented by displaying a picture or video image of the instructor. Instructors could have snapshots taken of students and have these mounted so that the instructor can see them. Although authentic visual images of the people interacting appears to have little influence on learning performance, it does have an impact on the affective disposition of the students and instructors.
16. Technology can introduce changes in ways of relating to students and can in some cases have advantages over direct contact. It should be remembered, however, that student and instructor expectations will initially be based on conventional experiences.
17. Interaction between the computer and the instructor or students presents opportunities for innovative teaching strategies, as well as providing visual elements in remote instruction.

Recent Research and Development

The system currently supports remote interaction with standard application packages for modeling, simulations, spread sheets, data base manipulation, and word processing without introducing communications facilities into these programs or requiring any special control by the user. Cordless lavalier microphones are now used by the instructors which increases their freedom of movement in the classroom.

In the Fall semester of 1987, Dr. Lewit taught the BASIC programming course (CSC 101) to both campuses. Nine students enrolled on the St. Croix campus while 26 students had enrolled on the St. Thomas campus. Initially, it was planned that the second lecture and one or two more lectures would originate from the St. Thomas campus. However, the instructor experienced a lack of recognition for students on the St. Thomas campus and decided, early in the semester, to change the format to alternating live-site lectures each week.

Dr. Rosenthal taught an advanced computer programming course to both campuses during the Fall 1987 semester. Students must have completed two programming courses in the sequence before registering for this course which focuses on computer architecture and machine language programming. Dr. Rosenthal taught this course using both the Apple-DOS and CP/M versions of INTERCEPT. Four students enrolled on

St. Thomas, the predominantly live site, while two students enrolled on the remote site, St. Croix. One student on the remote site required a great deal of tutoring, which was done by telephone appointments and by on site tutoring when the instructor visited for instruction on St. Croix.

During this Spring 1988 semester, a business administration course and a social science course are being taught using the distance learning system at UVI. The graduate level business administration course within the MBA program is presently being taught by Dr. James Kelly, a professor acquired by UVI through a special IBM education program. Nine students on the remote site of St. Croix have enrolled in this course. Although the primary interchange of information is via phone conferencing equipment, duplicate overhead transparencies are prepared and sent to both sites for each weekly class. Computers using a simple commercial communications driver are used to allow the remote site course facilitator to communicate silently in the background with the instructor's on-site facilitator.

Dr. Barbara Guilliard-Payne, an adjunct professor of UVI and connected with the U.S. Department of Conservation, was quick to recognize the value of the long-distance learning equipment in her effort to reach audiences in St. Thomas and St. Croix and allow them to interact. In addition, she requests guest lecturers in her sociology course from St. Croix. Dr. Guilliard-Payne has lectured from the St. Croix site one time and plans one or two more lectures from St. Croix. The class communicates solely by audio-conferencing, although the INTERCEPT equipment is sometimes used by the facilitator for background communication.

This telecommunications network is used more and more by the University for inter-campus meetings and communication and its influence continues to grow. The University of the Virgin Islands has developed policies to regulate distance learning with standards of instruction and personnel outlined.

Future Directions

The present system is based on an Apple IIe or Apple GS architectures, but the University is converting to Macintosh microcomputers, and the proposed projects will be able to take advantage of the superior graphic capability and user friendly icon interface provided by the Macintosh. The availability of a variety of Macintosh graphics software will reduce the present necessity to produce and maintain our own software to support instruction using sketching and pointing. As the technology develops and is improved, the possibilities for refining the distance learning system will expand.

The present network can be used to deliver instruction in a variety of formats. Some of the following formats will be explored in the future. A formal course or program might originate from a particular educational institution and be accredited by that institution or may be co-sponsored by all participating institutions with the accreditation possibilities being varied and flexible. Less formal cooperative efforts might be instituted to provide tutoring or workshops in basic skills or particular technical areas. The network might be the sole medium of instruction, or might be part of wider programs involving site visits, broadcast, correspondence, etc.

Reference materials might be transmitted over the network, mailed as documents or microfilm, or be made available through video disk technology. In the future, on-line

access to library resources and new techniques in low-cost mass storage media may provide better support to students in both home and remote sites.

The use of electronic mail might be expanded to improve communication between instructors at the distant site and students at the remote site. It might also be used to facilitate communications between students at all of the sites through such things as bulletin boards where students' questions, answers and comments could be displayed. Certain classes might use this type of format as a major component of a class, rather than as a supplement. Facsimile transmission may be used for submission of and response to class materials and homework.

The on-site use of computers for modeling, simulation or statistical analysis provides the student with additional resources. Student interaction with the above information resources forms a dialogue characterized by flexibility and student control over time, pace, and the direction of inquiry. Effort must be made in specification, planning and design to insure that optimal delivery mediums are selected for each area of instruction, and that adequate supporting resources are made available.

The professional development aspects of this system are being explored. It offers an opportunity to both import communications that would otherwise not be available and a vehicle for training existing faculty in effective instructional design and presentation.

The University of the Virgin Islands is developing a program for instructors to be given release time to design or redesign courses that can be delivered using telecommunications and microcomputers. The central theme in this instructional design program would be the identification of interactive activities which would support achievement of course objectives, selection of appropriate media for each activity and development of appropriate materials and techniques for these courses. Funding for this program is being sought through the Annenberg PBC/Project. It has been suggested that UVI should expand the scope of its distant learning program to include other universities in a consortium to develop further programs and projects in cooperation. Consortium members would be selected to include a variety of distant learning configurations and student audiences to provide mutual support in development, evaluation and dissemination of materials, techniques and results.

The future of distance learning in the Virgin Islands and the Caribbean looks very promising and the University of the Virgin Islands will play a leading role in its development.

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